INTERNATIONAL FOOD INFORMATION SERVICE

ifis

AB 17

February 1974

IICROBIAL TOXINS IN FOODS

ELECTED FROM VOLUME 5
OOD SCIENCE AND TECHNOLOGY ABSTRACTS

PRICE £2.00

sponsored by

Commonwealth Agricultural Bureaux, Farnham Royal, Bucks; Institut für Dokumentationswesen, Frankfurt am Main; Institute of Food Technologists, Chicago; Centrum voor Landbouwpublikaties en Landbouwdocumentatie (Pudoc), Wageningen; Zentralstelle für maschinelle Dokumentation, Frankfurt am Main.

Additional Services available from IFIS

CURRENT AWARENESS SERVICE

- Monthly searches of FSTA
- Personalized, computer assisted service
- Information available in 3 output formats
- Cost from £10 per year for references; £15 per year for abstracts
- Information selected to match your requirements on any aspect of Food Science and Technology

MAGNETIC TAPES

- Contains all information in FSTA, bibliographic data, abstracts, author and subject indexes
- 7– and 9– track IBM tapes available
- "Clean" tapes suitable for computer retrieval
- Cost £700 per year

Enquiries concerning the magnetic tape service should be addressed to;–

Dr. U. Schützsack
Institut für Dokumentationswesen,
6 Frankfurt/Main-Niederrad,
Herriostrasse, W. Germany.

See also back page

MICROBIAL TOXINS IN FOODS

VOLUME 5

FOOD ANNOTATED BIBLIOGRAPHY No. 17

ifis

©
INTERNATIONAL FOOD INFORMATION SERVICE,
LANE END HOUSE, NIRD,
SHINFIELD, READING, RG2 9AT,
ENGLAND.

ISBN 0 86014 016 4

First published in 1974

INTRODUCTION

Food Annotated Bibliographies (FABs) are collections of abstracts on specific topics in food science and technology. The topics are chosen by the staff of the International Food Information Service as being of particular interest or importance. The topics normally interest individual workers, who may not require the full information provided in Food Science and Technology Abstracts, from which the abstracts for the FABs are taken. The size and the cost of the FABs are controlled as much as possible with the interests of individual workers in mind.

Titles of the FABs now available are given on the back cover of this booklet. New titles are being added at the rate of about 10-20 per year. For up-to-date lists of FABs or suggestions for new topics please write to the address given overleaf. New subjects are searched for at least the five most recent volumes of Food Science and Technology Abstracts. Thereafter each FAB is updated monthly. Copies of each months abstracts on any topic may be obtained as indicated on the back cover of this publication. At the end of each volume of up-dating, the abstracts are merged and made available as a separate supplement to the original FAB.

Some of the larger FABs have been divided into sections to facilitate use. Abstracts are not printed in more than one section. The larger FABs also have subject indexes provided.

Copies of all original articles referred to in the abstracts may be bought (or occasionally borrowed) from the International Food Information Service. A form for ordering these is provided at the end of this FAB.

Coverage of the subject has been restricted to that of Food Science and Technology Abstracts, which covers over 1200 of the important food journals, patents from 20 countries and books published world-wide. Every effort is made to include all significant references, but editorial discretion is used on the many articles of borderline interest. If the reader particularly needs an exhaustive search of the subject, we will be pleased to provide any other references that we have available. We would in any case encourage readers to write or telephone us with any comments or queries they may have.

J. NEWTON
ASSISTANT EDITOR

1 B 8

Radiation resistance of spores of Clostridium botulinum type E. I.

Ando, Y.; Karashimada, T.; Ono, T.; Iida, H.

Food Irradiation [Shokuhin-Shosha] **3** (1) 5-12 (1968) [5 ref. En, ja] [Hokkaido Inst. of Public Health, Sapporo, Japan]

The effect of some factors on radiation resistance of spores of Cl. botulinum type E was studied. The following results were obtained. No significant difference was observed in radiation resistance of spores irradiated at 0, 10, and 20°C. It was, however, observed that radiation death rate decreases with increasing temp. between 20 and 50°C. At temp below -10°C, radiation resistance of spores increased. Min. point of radiation resistance of spores was found to be around 0°C. Organic and inorganic media were found to offer a slight protecting effect against radiation as compared with distilled water. Spore suspensions irradiated at equivalent dose levels showed much less viability with post irradiation incubation temp. of 10 and 20°C than with 30°C. 14 type E strains isolated in Hokkaido were tested for radiation resistence of spores. The average D-value was 0.138 Mrad, ranging from 0.174 to 0.103 Mrad. **AS**

1 E 29

[Sterilization of foodstuffs by irradiation.]

Sterilisation von Lebensmitteln durch Strahlen. [Review]

Diehl, J. F.

Zentralblatt für Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, IB **156** (2/3) 157-170 (1972) [53 ref. De, en] [Inst. für Strahlentech., Bundesforschungsanstalt für Lebensmittelfrischhaltung, Karlsruhe, Federal Republic of Germany]

Present knowledge of radiation preservation and insect disinfestation of foods is reviewed. Attention is drawn to the 1st petition for clearance of such foods in the Federal Republic of Germany and definitions and practical applications (with doses) are given of radappertization, radurization and radicidation. Particular microbiological example reproduced in tabular or graphical form include: treatment of spices; combined irradiation and heating of canned meat; organoleptic storage life of fish balls at 0°C following different irradiation doses, and rate of increase of colony count in irradiated and non-irradiated fish balls stored at 0°C for 42 days; the relationship between onset of decay and toxin formation in herring by Clostridium botulinum type E (inoculation of 10^5-10^7 spores/g); irradiation of lemons artificially infected with mildew; and the increase in colony count together with flavour assessment of meat balls stored at 4°C up to 21 days after irradiation or after heating in a plastics pouch immersed in boiling water for 5 min following irradiation (the latter gave far superior results). **ELC**

1 F 11

[Does O_2-free packaging encourage botulism?]

Kann Botulismus durch sauerstoffarme Verpackung begünstigt werden?

Lubieniecki-von-Schelhorn, M.

Fleischwirtschaft 50 (10) 1365-1367 (1970) [23 ref. De, en, fr] [Inst. für Lebensmitteltech. & Verpackung eV, 8000 Munich 50, Schragenhofstrasse 35, German Federal Republic]

Available evidence on the effect of vacuum packaging on development of Clostridium botulinum is critically examined. On suitable substrates, botulin formation occurred irrespective of presence or exclusion of O_2. The results are explained by the fact that low redox potential required for growth of Cl. botulinum persisted in the interior of the food. Incidence of botulism after consumption of vacuum-packaged smoked fish was attributed to neglect of hygienic precautions and to high storage temp. At storage temp. <3°C vacuum packaging is considered safe, provided hygienic precautions are observed. **RM**

1 S 75

Clostridium botulinum type F: isolation from venison jerky.

Midura, T. F.; Nygaard, G. S.; Wood, R. M.; Bodily, H. L.

Applied Microbiology **24** (2) 165-167 (1972) [16 ref. En] [Microbial Diseases Lab., California St. Dept. of Public Health, Berkeley, USA]

A Clostridium botulinum type F was isolated from the venison jerky responsible for the only type F botulism outbreak reported in the United States. The isolate differed from the prototype Langeland type F strain in being nonproteolytic. **AS**

2 B 11

Loss of viability by Staphylococcus aureus in acidified media. II. Inactivation by acids in combination with sodium chloride, freezing, and heat.

Minor, T. E.; Marth, E. H.

Journal of Milk and Food Technology **35** (9) 548-555 (1972) [17 ref. En] [Dept. of Food Sci., Univ. of Wisconsin, Madison, 53706, USA]

Determinations were made on extent to which Staph. aureus was inactivated [inability to grow on Trypticase Soy agar (TSA)] or injured [inability to grow on TSA + 7% added NaCl (TSAS)] in acidic artificial media and how inactivation was affected when some stresses common to food processing operations were inflicted on the organism. In TS broth at >pH 6 (24 h, 37°C), presence of 7% salt did not affect inactivation; at ≤pH 5, salt enhanced inactivation. Cells that survived this treatment were not sensitive to salt present in plating medium, whereas staphylococci from stationary growth phase (TS broth, pH 7) were sensitive to salt. Cells exposed to low pH were only slightly more sensitive to salt when plated on TSAS than were cells held at pH 7. Exposure of organisms to salt did not render them appreciably more sensitive to subsequent acid treatment than were untreated organisms. Freezing

(-30°C, 24 h) did not substantially enhance inactivation of Staph. aureus at low pH but injury was greatly increased. Sublethal heat treatment (60°C, 15 min) failed to markedly enhance injury or death of cells at low pH. Exposure to high and low temp. failed to increase susceptibility of staphylococci to acid and acid-treated cells were no more sensitive to effects of these temp. than untreated cells. Staphylococci exposed to a low pH exhibited extended lag phase when transferred to neutral nutrient media. [See FSTA (1972) 4 9B89 for part I.] AS

2 B 18

[Growth and death of microorganisms in relation to the medium with special consideration of combined technological influences. I. Growth and death of microorganisms in relation to the pH of the medium (in water-containing media at temperatures between the freezing point and the start of heat inactivation).] Vermehrung und Absterben von Mikroorganismen in Abhängigkeit vom Milieu unter besonderer Berücksichtigung kombinierter technologischer Einflüsse. I. Vermehrung und Absterben von Mikroorganismen in Abhängigkeit vom pH-Wert des Substrats (in wasserhaltigen Substraten, bei Temperaturen zwischen dem Gefrierpunkt und der beginnenden thermischen Abtötung).

Lubieniecki-von Schelhorn, M.

Chemie Mikrobiologie Technologie der Lebensmittel **1** (Mar.) 89-95 (1972) [27 ref. De, en, fr] [Inst. für Lebensmitteltech. und Verpackung, Tech. Univ., Munich, Federal Republic of Germany]

The effect of pH, alone or in combination with temp. or moisture equilibrium, on the behaviour (proliferation, inactivation) of various microorganisms of food significance, particularly Clostridium botulinum, Staphylococcus aureus and salmonellae, is reviewed from the literature. The major conclusion reached is that acid foods cannot be completely ruled out as causes of food poisoning. HBr

2 C 26

Staphylococcus aureus and staphylococcal food intoxications. A review. I. The staphylococci: characteristics, isolation, and behaviour in artificial media. II. Enterotoxins and epidemiology. III. Staphylococci in dairy foods. IV. Staphylococci in meat, bakery products, and other foods. [Review]

Minor, T. E.; Marth, E. H.

Journal of Milk and Food Technology **34** (11) 557-564; **35** (1) 21-29; (2) 77-82; (4) 228-241 (1971) [379 ref. En] [Dept. of Food Sci., Univ., Madison, Wisconsin 53706, USA]

2 C 31

[The occurrence of enterotoxin-producing staphylococci in man (food handlers).] Zum Vorkommen von enterotoxinbildenden Staphylokokken bei Menschen.

Untermann, F.

Zentralblatt für Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, IA **222** (1) 18-26 (1972) [24 ref. De, en] [Inst. für Lebensmittelhygiene, Freie Univ., Berlin (West)]

2 C 32

Detection of orally toxic microbial metabolites in foods with bioassay systems.

Waart, J. de; Aken, F. van; Pouw, H.

Zentralblatt für Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, IA **222** (1) 96-114 (1972) [59 ref. En, de] [Central Inst. for Nutr. & Food Res. TNO, Zeist, The Netherlands]

A total of 32 biological test systems, including 6 protozoa, 4 fish species, 5 insect types, bull spermatozoa, 4 cell lines, 9 microorganisms, embryonated hens' eggs and Daphnia and Artemia, were studied for sensitivity to 10 toxins of microbial origin: 2 aflatoxins, 3 botulinum toxins, 2 Escherichia coli-toxins, 2 staphylococcal enterotoxins and histamine. No assay system with significant sensitivity to all the toxins tested was discovered. Selective sensitivities established by others, while this study was in progress [de Waart, Antonie van Leeuwenhoek (1967) **33**, 230], were confirmed. Some protozoa, fish, Artemia and, particularly, Daphnia were found sensitive to clinically significant concn. of histamine, Locusta migratoria and 2 human cell lines to staphylococcal enterotoxins, while Daphnia and 3 fish species were found sensitive to very low concn. of aflatoxin B_1. AS

2 C 37

Effect of temperature and pH on production of staphylococcal enterotoxin in brain heart infusion broth and in food.

Scheusner, D. L.

Dissertation Abstracts International, B **33** (2) 836: Order no. 72 22 283 (1972) [En] [Michigan St. Univ., East Lansing, 48823, USA]

The effects of temp. and pH on growth and enterotoxin production of Staphylococcus aureus strains were investigated. Strain 243 was inoculated into Brain Heart Infusion (BHI) broth with the initial pH adjusted within the range 3.6-9.9, with or without 0.2M phosphate buffer. Growth occurred in the range pH 4.7-9.4, whereas enterotoxin production was restricted to the range 5.1-9.0. Enterotoxin production was more rapid in the unbuffered medium. 4 strains were inoculated into buffered BHI broth and incubated at temp. in the range 7-50°C. None grew at 7 or 50°C; all grew at 13°C, but only one produced enterotoxin. All grew and produced enterotoxin in the range 19-39°C; 3 grew and produced enterotoxin at 45°C, the population of the other strain declining rapidly. All grew and produced enterotoxin in vanilla pudding incubated at 19-45°C. Numerous foods were inoculated with Staphylococcus aureus; considerable variations in growth and enterotoxin production were found. Growth in food could not be directly correlated with growth in BHI broth. AJDW

2 J 317
[Determination and occurrence of coagulase-positive staphylococci in deep-frozen spinach puree.]
Ergebnisse von Untersuchungen hinsichtlich des Nachweises und Vorkommens von Plasmakoagulase-positiven Staphylokokken in Tiefgefrier-Spinatpüree.
Klaushofer, H.; Radinger, D.; Schaller, A.
Confructa **17** (4/5) 214-236 (1972) [93 ref. De, en] [Inst. für Lebensmitteltech., Hochschule für Bodenkultur, Vienna, Austria]

This paper present a continuation of the authors' studies on the microbiology of spinach puree [see FSTA (1969) **1** 6C251 for references]. A total of 35 cartonboard containers (200-, 350- or 600-g capacity) of deep frozen spinach puree from 3 industrial campaigns (9, 13 and 13 containers respectively) gave the following total bacterial counts/g (mean values with ranges), 273 000 (174 000-360 000), 45 300 (25 000-74 000) and 44 100 (27 000-93 000). Corresponding values for coagulase-positive staphylococci counts/g (obtained using the Baird-Parker medium found in preliminary tests to be the most satisfactory for the purpose) were 47.1 (38-58), 54.2 (40-84) and 54.3 (34-86). Plasma coagulase activity was demonstrated in about half of the samples examined, there being no significant difference between campaigns. SKK

2 P 104
Serological typing of staphylococci isolated from milk and milk products.
Ghosh, S. S.; Laxminarayana, H.
Indian Journal of Animal Sciences **42** (3) 185-189 (1972) [8 ref. En] [Nat. Dairy Res. Inst., Karnal, Haryana]

738 strains of staphylococci isolated from milk and milk products, together with 36 human strains, were typed according to the serological method of White [Journal of Comparative Pathology (1962) **72**, 19-28], using type strains A, B and C for production of antisera. Of the isolates from dairy products, 235 of 319 coagulase-positive strains (including 23 of 25 enterotoxigenic strains) could be typed; 59.6% were type A, 30.2% type C and 10.2% type B. None of the enterotoxigenic strains was type B. None of the 419 coagulase-negative strains from dairy products or the 36 human strains could be typed by this method. All 3 serotypes were found in raw milk and kulfi, types A and B were found in pasteurized milk, types A and C in ice cream and cheese, type C in dried milk and type B in butter. CDP

2 R 121
[Importance of dosimetry for the estimation of possible risks in food irradiation: e.g. the problem of Clostridium botulinum in irradiation of fish.]
Die Bedeutung der Dosimetrie für die Abschätzung eines möglichen Risikos bei der Lebensmittelbestrahlung, am Beispiel des Clostridium Botulinum-Problems bei der Strahlenkonservierung von Fisch.
Ehlermann, D
Lebensmittel-Wissenschaft + Technologie **4** (6) 207-209 (1971) [8 ref. De] [Inst. für Strahlentech., Bundesforschungsanstalt für Lebensmittelfrischhaltung, 75-Karlsruhe, Federal Republic of Germany]

The literature on development of Clostridium botulinum toxin (Type E) in irradiated fish is reviewed and discussed. The time period and storage conditions required for toxin development are compared with those for decomposition of the fish apparent to an untrained person. Data are tabulated for toxin development in inoculated vacuum packed haddock fillets in terms of decomposition time (days) at 10°, 7.2°, 5.5° and 3.3°C, with radiation doses of 0, 0.1 and 0.2 Mrad and inocula of 10^2, 10^4 and 10^6/g. Toxin development was more rapid than decomposition at 7.2° and 10°C and also with reducing dosage; with 0.2 Mrad and storage at 3.3°C no toxin was found. Results differed relatively less with size of inoculum. Data are also tabulated showing the supplementary radiation doses required to inhibit toxin formation. It is considered that a Cl. botulinum risk is possible with irradiated fish because the mean value of doses applied in practice is inadequate and moreover these values may be used to calculate max. and min. doses. The quotient of max./min. doses should not exceed 1.3 but procedures giving a value of 2.0 may be accepted in commercial practice. Further experiments with more closely defined dose ranges are required to determine reliable commercial conditions. ELC

2 S 230
Controls of Clostridium botulinum and Staphylococcus aureus in semi-preserved meat products. [Review]
Riemann, H.; Lee, W. H.; Genigeorgis, C.
Journal of Milk and Food Technology **35** (9) 514-523 (1972) [106 ref. En] [Dept. of Epidemiology and Preventive Med., School of Vet. Med., Univ. of California, Davis, 95616, USA]

The prevalence of Cl. botulinum and Staph. aureus in packaged, moist, meat products cured with 1-7% salt and pasteurized at <100°C is discussed. The effects of temperature, pH, brine concentration, wood smoke, packaging, and glucose are reviewed. JN

2 S 246
Rapid characterization of bacteria, with emphasis on Staphylococcus aureus.
Fung, D. Y. C.; Hartman, P. A.
Canadian Journal of Microbiology **18** (11) 1623-1627 (1972) [41 ref. En, fr] [Dept. of Food Tech., Iowa St. Univ., Ames, USA]

During a course of studies on Staphylococcus aureus in turkey products, several multiple-inoculation methods for characterizing large numbers of isolates were developed. The procedures are detailed and their efficiency in characterizing staphylocci demonstrated by results obtained using stock cultures and unknown strains isolated from turkey meat thought to be the vehicle of a staphylococcal food poisoning outbreak and isolates from commercially frozen turkey rolls and

turkey roasts. The methods could be adapted for similar situations where identification of a large number of isolates is desired in the rapid identification of bacteria isolated from other foods. AA

2 S 276
[Staphylococcal contamination of beef.]
Zagaevskii, I. S.
Voprosy Pitaniya **31** (5) 64-67 (1972) [8 ref. Ru, en] [Sel'skokhoz. Inst. Belaya Tserkov', USSR]

Examination of carcasses and organs of 312 cattle with liver-fluke liver cirrhosis, 68 with parenchymal mastitis, 76 with breast muscle and stomach wall injuries, 24 with bone and spice fractures, and 12 healthy cattle held without food for 3 days before slaughter showed heavier staphylococcal contamination than in 55 healthy, normally slaughtered cattle. Only the last did not show any muscle contamination. It was found that staphylococci multiplied 3-4 × more in ground beef than in lumps and 2-3 × more in boiled meat than in raw. The most favouravle conditions for enterotoxin formation in cooked meat and liver were in storage at 28-37°C and pH of 6.7-7.2. SKK

2 U 126
[Microbiological standards for foods.]
Tjaberg, T. B.
Norsk Veterinaertidsskrift **84** (2) 95-101 (1972) [4 ref. No] [Inst. for Naeringsmiddelforskning, Boks 8146, Oslo Dep. Oslo 1, Norway]

A detailed discussion is given of the USDA & FDA proposed system of testing for salmonellae, based on classification of foods into 5 different categories on the basis of likelihood of salmonella infection. An appendix gives standards currently applicable in Scandinavian countries, and includes: Norway (the Oslo Health Council), covering total and coliform counts in cooked and raw meat products and sliced meats; Denmark, covering total, faecal streptococcal, staphylococcal, coliform and faecal coliform counts in frozen minced meat, and total, faecal streptococcal and staphylococcal counts in fresh meat (heat treated, sliced, minced); and Sweden, covering total, coliform, staphylococcal, enterococcal, Clostridium perfringens, Bacillus cereus and salmonella counts in cooked, sliced vacuum packaged meats. Some unofficial Danish microbiological standards for meat products are also included. HBr

3 C 66
Food poisoning due to staphylococcal enterotoxin E.
Morris, C. A.; Conway, H. D.; Everall, P. H.
Lancet **II** (7791) 1375-1376 (1972) [En] [Public Health Lab., Mytton Oak Road, Shrewsbury SY3 8XH, UK]

An outbreak of food poisoning affecting 100 of 200 soldiers on a route march is described. The cause was found to be ham sandwiches and sausage rolls which had been stored for 30 h at room temp., wrapped in polyethylene. The offending organism was found to be enterotoxin E producing Staphylococcus aureus, present at levels of 9×10^9/g in the ham and 1.25×10^7/g in the sausage meat. JN

3 C 70
Serological detection of enterotoxin in foods implicated in staphylococcal food poisoning.
Gilbert, R. J.; Wieneke, A. A.; Lanser, J.; Simkovicova, M.
Journal of Hygiene **70** (4) 755-762 (1972) [18 ref. En] [Food Hygiene Lab., Central Public Health Lab., Colindale Avenue, London NW9 5 HT, UK]

2 methods for the extraction of enterotoxin from foods involved in incidents of staphylococcal food poisoning are described. Enterotoxin was detected serologically in 12 of 24 food samples from 20 separate incidents; 8 samples contained enterotoxin A, 3 contained D and one both A and B. The amount of enterotoxin, based on 100% recovery, ranged from 0.02-0.09 µg/g. Foods implicated included: prawns (canned), prawns (frozen), cold chicken, trifle, ham, and veal, ham and egg pie. Details are also given of the numbers of Staphylococcus aureus isolated from samples of food from 39 food poisoning incidents. Colony counts varied between 7.5×10^5 and 9×10^9/g. AA

3 C 74
[Microbiological analysis of dehydrated soups.]
Buttiaux, R.
Annales de la Nutrition et de l'Alimentation **26** (5) Techniques 1-21 (1972) [Fr] [CNERNA, Inst. Pasteur, Lille, France]

Standard analytical methods are recommended for quantitative determination of mesophilic aerobes, Escherichia coli (/g of product), spores of Clostridium presumed perfringens, Salmonella, pathogenic or presumed enterotoxic staphylococci, spores of Bacillus cereus, yeasts and moulds. RM

3 R 151
Experimental production of enterotoxin B in fish protein concentrate.
Fung, D. Y. C.
Journal of Milk and Food Technology **35** (10) 577-581 (1972) [37 ref. En] [Dept. of Microbiol., Pennsylvania St. Univ., University Park, 16802, USA]

Staphylococcus aureus S-6 grew and produced enterotoxin B in two samples of fish protein concentrate (FPC) and three FPC-supplemented foods (beef broth, corn flour, and wheat flour). Enterotoxin B yields increased as concentrations of FPC increased in FPC suspensions as well as FPC-supplemented foods. Toxin yields obtained from FPC-supplemented beef broths (100 to 160 µg/ml) were higher than from FPC-supplemented corn flour and wheat flour (15 to 45 µg/ml). Small inocula (10^3 cells/ml) and large inocula (10^7 cells/ml) gave equivalent growth and toxin production after 24 h incubation. AS

4 B 34
Microbiological standards for foods: prospects and perspectives. [Review]
Sulebele, G. A.
Indian Food Packer 26 (2) 45-61 (1972) [182 ref. En] [Dept. of Chem. Tech., Univ., Bombay-19, India]

Microbiological quality control programmes, methods employed, and problems of quality evaluation of processed foods are discussed. Among the topics reviewed are: usefulness and limitations in microbiological quality control of total bacterial count, direct microscopic count, yeast and mould count, and counts of spore-formers; coliforms and enterococci as indicators of faecal contamination; detection and enumeration of pathogens (Clostridium, Staphylococcus, Salmonella); and detection of fungal and bacterial toxins. JA

4 C 83
Spoilage and disease problems.
Foster, E. M.
Proceedings of the Meat Industry Research Conference Mar., 61-72 (1972) [En] [Food Res. Inst., Univ. of Wisconsin, Madison, 53706, USA]

The incidence of food-borne disease is discussed with reference to: Staphylococcus aureus; Clostridium perfringens; salmonellae; Escherichia coli; Shigella sonnei; Clostridium botulinum; Trichinella spiralis; and Toxoplasma gondii. Staphylococci, Cl. perfringens and salmonellae account for three-quarters of the outbreaks and almost 90% of the cases of illness reported by the Center for Disease Control in the USA. Meat and poultry products are frequent vehicles of all 3, with food containing raw or undercooked eggs responsible for 25% of the food-borne incidents of salmonellosis. AA

4 C 89
Food contamination.
Roberts, D.; Hobbs, B.
Nutrition and Food Science No. 29, 10-14 (1972) [7 ref. En]

Bacterial contamination of foods during preparation is discussed with reference to Staphylococcus aureus, Clostridium welchii, Bacillus cereus, Clostridium botulinum, salmonellae, and Vibrio parahaemolyticus. Tables give details of: Growth of intestinal pathogens in cooked chicken breast meat at different temp.; Outbreaks of staphylococcal food poisoning in England and Wales (1969-1971); Bacterial food poisoning in England and Wales 1967-1969 (average per annum); Bacterial food poisoning outbreaks in England and Wales 1967-1969; Food vehicles and causal agents in general and family outbreaks (total for 3 yr). AA

4 C 95
Botulism. [Review]
USA, Institute of Food Technologists, Expert Panel on Food Safety & Nutrition
Journal of Food Science 37 (6) 985-988 (1972) [7 ref. En]

A brief review of the incidence of botulism is followed by a description of the microorganism and the illness, its causes and distribution in nature, and methods for determining the cause of suspected outbreaks. Most botulism outbreaks are attributed to home-preserved foods; commercial processing methods sufficiently control the problem. General procedures to keep foods safe from botulism are reviewed concluding that proper food safety can be achieved by following proper procedures exactly, use of good sanitation, and most importantly, good common sense. IFT

4 S 403
Nitrite in the control of Clostridium botulinum.
Greenberg, R. A.
Proceedings of the Meat Industry Research Conference Mar., 25-34 (1972) [9 ref. En] [Res. & Development Center, Swift & Co., Oak Brook, Illinois 60521, USA]

Results of a study on the effect of nitrite and nitrate on botulin toxin formation in canned ham are discussed. 8 levels of nitrite (0-500 ppm) and 4 levels of nitrate (0-2000 ppm) were tested; 2 levels of spores (100 and 10 000/g) were tested, along with uninoculated controls. The inocula consisted of a mixture of 5 strains of type A and 5 strains of type B Clostridium botulinum. The inocula were mixed into the meat immediately after the nitrate and nitrate were added. The level of nitrite necessary to completely inhibit toxin production was dependent upon initial spore levels. At the low inoculum level no toxin was confirmed in samples formulated with ≥200 ppm nitrite throughout 6 months' storage at 80°F. At the high inoculum level no toxin formation was confirmed at the 500 ppm nitrite level and few samples were toxic at ≥200 ppm. The level of nitrite at the time of product manufacture was the key protective factor. It would appear that the nitrite either reacts directly with the spores or that in the reaction with the meat components substance(s) is formed which inhibits germination and/or outgrowth of spores. Sodium nitrate did not demonstrate anti-botulin activity. There was no evidence of mutual enhancement or synergism in samples containing combinations of nitrite and nitrate. AA

4 S 470
Observations on procedures for thawing and spit-roasting frozen dressed chickens, and post-cooking care and storage: with particular reference to food-poisoning bacteria.
Roberts, D.
Journal of Hygiene 70 (3) 565-588 (1972) [20 ref. En] [Central Public Health Lab., Colindale Avenue, London, NW9 5HT, UK]

4 methods of thawing frozen chickens were compared, i.e. (i) holding at room temp. at 15-

21°C; (ii) storage in a domestic refrigerator at 4°C overnight; (iii) immersion in cold running water at 16-21°C; and (iv) holding at room temp. with removal of giblets as soon as possible. Mean thawing times in h/lb wt. of chicken, in and out of their polyethylene packaging respectively were: (i) 2.9, 2.0; (ii) 8.1, 7.9; (iii) 1.2, not tested; and (iv) 2.2, 1.7. Fully and partially thawed chickens, inoculated with salmonellae, Clostridium welchii and Staphylococcus aureus were cooked in a spit-roasting oven for varying periods of time at thermostatically controlled temp. The chickens were examined freshly cooked and after storage. Spit-roasting fully thawed chickens until the outer skin was golden brown was sufficient heat treatment to kill salmonellae and Staph. aureus, but Cl. welchii could survive. Salmonellae could also survive if the chickens were not fully thawed before cooking. Incorrect storage after cooking also encouraged the growth of pathogens. A survey was also made of the incidence of intestinal pathogens in frozen dressed chickens and environmental hazards in spit-roasting establishments. AA

5 A 255

[Immunological methods in food research.] [Lecture]
Schothorst, M. van; Leusden, F. M. van; Heemskerk, P. A. M.
Tijdschrift voor Diergeneeskunde **98** (3) 166-170 (1973) [1 ref. Nl, en] [Rijks Inst. voor de Volksgezondheid, Postbus 1, Bilthoven, The Netherlands]

3 immunological methods used in investigations of food are discussed: detection of foreign proteins in raw meat products; detection of staphylococcal enterotoxin by precipitation techniques; and the immunofluorescent procedure for isolation of Salmonella. AS

5 B 56

[Pathogenic staphylococci in foods.] [Review]
Ienistea, C.; Chitu, M.; Roman, A.; Ionescu, C.
Igiena **21** (8) 489-494 (1972) [23 ref. Ro, fr, de, en, ru] [Inst. de Igiena si Sanatate Publica, Bucharest, Rumania]

5 C 98

[Study of the detection of staphylococcal enterotoxins in milk and other foods.]
Untersuchungen über den Nachweis von Staphylokokken-Enterotoxinen in Milch und anderen Lebensmitteln.
Schmidt, H.; Weis, W.; Wever, H.
Archiv für Lebensmittelhygiene **23** (7) 141-146 (1972) [48 ref. De, en] [St. Veterinäruntersuchungsamt, Krefeld, Federal Republic of Germany]

Some 155 000 milk samples of various types and 75 meat products were examined for presence of staphylococci. Staphylococci, but not necessarily toxin-producing strains occurred in relatively high numbers in the milk of animals suffering from impaired secretion; they also occurred in unpackaged pasteurized milk containing coli organisms, but not in soured milks or yoghurt. Serological and biological tests for determining whether or not the staphylococci present in milk were toxin-producing strains were too expensive and time-consuming for routine use, and were insufficiently conclusive. Absence of enterotoxins, however, was indicated by a negative result in the Stojanow test which utilizes the sensitivity of frog spermatozoa to certain toxins. Lysogenis and phage-typing were of little value in indentifying enterotoxin-producing strains; 4 of 9 isolates with the same phage pattern did not produce detectable amounts of toxin under the experimental conditions. GTP

5 C 103

[Occurrence and prevention of microbial food contamination and food poisoning.] Entstehung und Verhütung von mikrobiellen Lebensmittelinfektionen und -vergiftungen. [Book]
Seeliger, H. P. R.
117pp ISBN 3 506 18018 5 (1971) [many ref. De] Ferdinand Schöningh Verlag Paderborn, Federal Republic of Germany [Inst. für Hygiene und Mikrobiologie, Univ., Würzburg Federal Republic of Germany]

This practically oriented book, in the 'Modern Domestic Science' series, is written from the viewpoint of the hygienist and microbiologist, and is designed for all persons actively engaged in food production, from the housewife to the head cook in hospitals or institutions. The topic is covered in the following chapters: Legislation governing foods and epidemics; Proliferation of microorganisms and occurrence of their toxins in foods; Causes, interrelationships and required measures for prevention of food contamination and food poisoning; Cleaning and disinfection in kitchen and home; and Basic rules governing food processing hygiene in kitchen and home. A 5-pp. bibliography is appended. HBr

5 C 109

Staphylococcal food poisoning. A review. I. Characteristics and isolation of staphylococci, properties of enterotoxins, and epidemiology of staphylococcal intoxications.
Minor, T. E.; Marth, E. H.
Indian Journal of Nutrition and Dietetics **9** (3) 161-186 (1972) [213 ref. En] [Dept. of Food Sci. & the Food Res. Inst., Univ. of Wisconsin, Madison, 53706, USA]

5 C 110

Staphylococcal food poisoning. A review. II. Behaviour of staphylococci in artificial media and foods.
Minor, T. E.; Marth, E. H.
Indian Journal of Nutrition and Dietetics **9** (4) 225-243 (1972) [120 ref. En]

5 C 120

[Principles of food poisoning classification.]
Budagyan, F. E.
Voprosy Pitaniya No. 1, 60-66 (1973) [16 ref. Ru] [Kafedra Gigieny Pitaniya, Tsentral'nyi Inst. Usovershenstvovaniya Vrachei, Moscow, USSR]

5 C 132
[Modern encyclopaedia of food hygiene. Vol. IV. Food poisoning.] Encyclopedie moderne de l'hygiene alimentaire. Tome IV. Les intoxications alimentaires. [Book]
Lederer, J.
156pp. (1970, publ. 1971) [Fr]
The following aspects are dealt with: toxins of bacterial origin; toxic components in plant foods; contamination of foods by radioactive elements such as ^{90}Sr, ^{137}Cs and ^{131}I; toxic components in fish and related products; food additives; colorants; contamination of foods with metallic salts; pesticide residues; and antibiotic residues. AA

6 C 150
Comparison of poured and surface inoculated plates of Baird-Parker's medium for enumerating Ataphylococcus aureus in foods.
Sharpe, A. N.; Jackson, A. K.
Journal of Applied Bacteriology **35** (4) 681-684 (1972) [4 ref. En] [Unilever Res. Lab., Colworth House, Sharnbrook, Bedford, UK]
In tests involving 35 strains of coagulase-positive Staph. aureus and 149 Staph. aureus-positive food samples, Baird-Parker's medium (Oxoid) gave excellent recovery in both pour and spread plates, regardless of the vol. of agar or whether results were quoted on the basis of visual inspection or after coagulase tests. Additional inhibition of growth of other types of organisms on pour plates compared with spread plates was shown for samples of fish (up to 100-fold), chicken and ham (3 to 10-fold) but not for peas, comminuted meat or cream. The use of thin agar layers (8 ml instead of 16 ml) for both pour and spread plates ensured max. colony visibility and had the additional advantages of economy of medium and ease of picking out colonies. CDP

6 R 254
Clostridium botulinum and smoked fish production: 1963-1972. [Review]
Pace, P. J.; Krumbiegel, E. R.
Journal of Milk and Food Technology **36** (1) 42-49 (1973) [61 ref. En] [Health Dept., 841 N. Broadway, Milwaukee, Wisconsin 53202, USA]
Occurrence of Cl botulinum in fish of the Great Lakes was not generally suspected until 1963. Surveillance studies conducted since then have revealed type E to be the most prevalent toxin type in fish and environmental samples of the area. Toxin types A and C, as well as non-proteolytic type B, have been detected only occasionally in Great Lakes fish. Research performed at a variety of laboratories, much of it since the human botulism outbreak traced to smoked fish in 1963, has provided insight into the physiology of Cl. boutlinum type E and its spore form. Inoculated pack studies have elucidated conditions of storage which lead to elaboration of toxin. These data have been reviewed and collated with those derived from studies designed to evaluate the Milwaukee Smoked Fish Ordinance. Processing and handling requirements of the ordinance are delineated; the importance of limiting the time and temp. allowed for distribution of this mildly cooked product is emphasized. AS

7 C 185
[Food poisoning classification.]
Petrovskii, K. S.
Gigiena i Sanitariya No. 3, 91-95 (1973) [Ru] [I Moskowskii Med. Inst. imeni I. M. Sechenova, Moscow, USSR]
(i) the food infection and poisoning classification scheme proposed by F. E. Budagyan at the All-Union Food Poisoning conference in Erevan in 1969 and (ii) a scheme of food poisoning classification put forward by the author are presented. The main divisions of (i) classification are: food (intestinal) infections [major infectious diseases]: food subinfections (toxicoinfections) [pathogenic coliforms, Proteus, Clostridium perfringens type A, Bacillus cereus, enterococci]; food poisoning of microbial origin; food poisoning of non-microbial origin; and food infection and poisoning of unestablished aetiology. The main divisions of (ii) are: food poisoning of bacterial origin; food poisoning of fungal origin (mycotoxicoses); and food poisoning of non-microbial origin (subdivided into chronic and acute types). SKK

7 C 197
Chemistry of the staphylococcal enterotoxins.
Bergdoll, M. S.
Abstracts of Papers, American Chemical Society **165**, AGFD 27 (1973) [En] [Food Res. Inst., Univ. of Wisconsin, 2115 Herrick Drive, Madison, 53706, USA]
5 staphylococcal enterotoxins, the cause of staphylococcal food poisoning, have been purified and their physicochemical properties determined. They are single-chain polypeptides of 25 000-30 000 mol. wt. with one disulphide bridge. The amino acid sequence of enterotoxin B shows that the disulphide bridge is near the centre of the polypeptide chain. The enterotoxins are very compact molecules. Substitution of a high % of the tyrosine, aspartic and glutamic acid, lysine, and methionine residues can be accomplished without inactivation of the toxin, providing the tertiary structure is not greatly altered. AS

7 C 198
[Mode of action and effects of staphylococcal enterotoxins.] [Review]
Bugrova, V. I.
Voprosy Pitaniya No. 2, 69-74 (1973) [42 ref. Ru] [Inst. Pitaniya AMN SSSR, Moscow, USSR]

7 C 200
Toxic proteins produced by Clostridium botulinum.
Schantz, E. J.; Sugiyama, H.
Abstracts of Papers, American Chemical Society 165, AGFD 37 (1973) [En] [Univ. of Wisconsin, Madison, 53706, USA]

The toxins that cause botulism are simple proteins and are produced in foods by C. botulinum. There are a total of 8 immunologically distinct types of toxins designated A, B, C_1, C_2, D, E, F and a recently reported type G. The organisms are typed according to the toxin they produce and are widely distributed in our environment. Botulism in man is usually caused by Types A, B, E, and F; in animals by Types C and D. Type E is common in seafoods. Evidence to date indicates that formation of some of the toxins is mediated by a temperate bacteriophage. The toxins of C. botulinum are the most poisonous substances known to man. The mol. wt. of crystalline Type A toxin is 900 000. The molecule appears to be a complex of a neurotoxic protein of about 150 000 mol. wt. with another protein of higher mol. wt. that is nontoxic. The other types of toxin produced in culture are lower mol. wt. (≤500 000). Types B and E also possess a neurotoxic fraction of about 150 000 mol. wt. with a nontoxic protein. Certain functional group reactions such as acetylation, deamination, and certain types of irradiation cause a rapid detoxification. The toxins are highly antigenic. The entire mechanism of action of the toxins is not known, but in some way they inhibit the release of acetylcholine at the presynaptic nerve endings. Studies on the chemical and physical properties of the toxins in relation to toxicity are presented. AS

7 P 922
Staphylococcus aureus and enterotoxin A in cream and butter.
Minor, T. E.; Marth, E. H.
Journal of Dairy Science 55 (10) 1410-1414 (1972) [14 ref. En] [Dept. of Food Sci., Univ. of Wisconsin, Madison, 53706, USA]

Cream used in butter manufacture was able to support growth of Staph. aureus 100 (a strain which produces only enterotoxin A) when stored at 37°C for 16 h, regardless of size of inoculum (10^3 or 10^6/g); Staph. aureus produced 1 µg enterotoxin A/100 g cream when inoculated at 10^6/g into pasteurized cream and stored at 37°C for 24 h, the staphylococci having increased approx. 100-fold within 16-h, then entered a stationary phase. Only minimal growth of staphylococci occurred during storage at 23°C for 16 h. Staphylococcal growth in butter was greatest when salt concn. was <1.5%; the organisms were able to survive at 23°C in butter containing 1.5% salt, but at 10°C numbers decreased 30-fold in 14 days. Whipping enhanced survival in butter at 10°C. When butter was made from cream initially containing 10^6 staphylococci/g, buttermilk contained slightly more staphylococci than the cream and approx. the same concn. of enterotoxin; wash water contained 10-fold fewer staphylococci and less enterotoxin than buttermilk. Butter contained 100-fold fewer staphylococci than the buttermilk and the ratio of toxin in buttermilk to toxin in butter was approx. 8:1 to 16:1. CDP

7 P 966
[Detection of staphylococcal enterotoxin type B in foods by immunofluorescence. I. Detection of enterotoxin in milk and twarog.]
Pliszka, A.; Windyga, B.
Roczniki Panstwowego Zakladu Higieny 23 (5) 565-574 (1972) [30 ref. Pl, ru, en] [Panstwowy Zaklad Higieny, Warsaw, Poland]

Samples of human milk naturally contaminated with coagulase-positive staphylococci, and samples of twarog (experimentally contaminated with a strain of Staphylococcus aureus isolated from human milk and producing large amounts of type B enterotoxin, or made from experimentally contaminated cows' milk), were prepared for analysis by the method of Read et al. [J. Dairy Sci. (1965) **48**, (4) 411-419 & 420-424] and examined by the immunofluorescence method of Genigeorgis & Sadler [J. Fd. Sci. (1966) **31** (4) 605-609]. Type B enterotoxin was detected in 10 of the 20 samples of human milk examined, whereas the double diffusion method Roczn. panst. Zakl. Hig. (1971) **22** (5) 537-544 detected the enterotoxin in only 4 of the 10 fluorescence-positive samples. No staphylococci or enterotoxin were detected in samples of contaminated twarog (1500 staphylococci/g) after incubation at 30°C for 48 h, but both were detected in twarog made from contaminated milk (76-800 staphylococci/ml) when acidification was inhibited by addition of penicillin. SKK

7 P 967
[Detection of staphylococcal exterotoxin type B in foods by immunofluorescence. II. Detection of enterotoxin in ice cream and meat.]
Pliszka, A.; Windyga, B.
Roczniki Panstwowego Zakladu Higieny 23 (6) 649-655 (1972) [7 ref. Pl, ru, en]

Samples of ice cream were prepared for analysis by the method of Read et. al. [see preceding abstr.] modified by the introduction of a dialysis stage to remove sugar which interfered with the serological reaction; different quantities of purified type B enterotoxin were added to the extract which was then concentrated 10-fold and examined by immunofluorescence as described in the preceding abstr., and also by indirect specific staining using fluorescein-conjugated anti-rabbit IgG goat serum. Similar experiments were carried were carried out with samples of ice cream fo which the enterotoxin was added directly and also with a sample of ice cream (from a case of food poisoning) containing >1 million coagulase-positive staphylococci/g. It is concluded that the direct method gave better results than the indirect method, that both could be used for ice cream, and that the laborious preparation of extracts should be simplified. Similar experiments were carried out with raw or sterilized meat contaminated with S_6 Strain of staphylococci or with raw meat with added enterotoxin, the Read et al. and the Casman & Bennett [Appl. Microbiol. (1965) **13**, 181] methods being used for extract preparation. The conclusions were as for ice cream. SKK

7 R 332
A proposed method for testing the possibility of a botulism hazard in radiation-pasteurized fish.
Ronsivalli, L. J.; Schwartz, M. S.; Nickerson, J. T. R.
Isotopes & Radiation Technology 8 (2) 211-218 (1970) [17 ref. En] [Bureau of Commercial Fisheries, Tech. Lab., Emerson Avenue, Gloucester, Massachusetts 01930, USA]

The promise of economic savings from the use of ionizing radiation to preserve fish is weakened by the uncertainty as to whether or not this treatment allows botulinum Type E toxin to develop before the consumer rejects the product because of obvious spoilage. The test proposed here compares the specific time at which the consumer can detect spoilage in either irradiated or nonirradiated fish with the specific time at which toxin develops in the products. The available data indicate that this test can determine whether or not a botulism hazard exists. AS

8 C 209
Natural toxins in food and feeds. [Symposium]
Buck, W. B.; Oehme, F. W. (USA, American College of Veterinary Toxicologists Bergdoll, M. S.; Goldblatt, L. A.; Stoloff, L.) (Editors)
Clinical Toxicology 5 (4) 437-580 (1972) [many ref. En]

In July 1971, in conjunction with the 108th Annual Convention of the American Veterinary Medical Association, the American College of Veterinary Toxicologists sponsored a scientific session with a symposium on natural toxins in food and feeds. Papers presented at the symposium are given and include: The nature of bacterial toxins, by M. S. Bergdoll (pp. 441-451, 37 ref.); Implications of mycotoxins, by L. A. Goldblatt (pp. 453-464, 28 ref.); and Analytical methods for mycotoxins, by L. Stoloff (pp. 465-494, 137 ref.). JA

8 C 214
[Staphylococcal food poisoning. I. Incriminated foods and coagulase activity of the isolates in outbreaks in Tokyo.]
Zenyoji, H.; Terayama, T.; Ushioda, H.; Igarashi, H.; Maruyama, T.; Sakai, S.
Journal of the Food Hygienic Society of Japan [Shokuhin Eiseigaku Zasshi] 12 (4) 311-314 (1971) [11 ref. Ja, en] [Dept. of Bacteriol., Tokyo Metropolitan Res. Lab. of Public Health, Japan]

During 1965-1969, 90 outbreaks of staphylococcal food poisoning were reported in Tokyo. Of them, 55 showed complete agreement with regard to coagulase activity of isolates from incriminated foods and patients. Incriminated foods in 66% of the outbreaks were typically Japanese and mainly composed of rice; the remainder included cake, (15%), baked egg, (7%), salad, (5%), bread, (3.5%), and miscellaneous foods (3.5%). As for coagulase types of isolates, 14 outbreaks were caused by type II organisms, 16 by type III, 11 by type VI, and 14 by type VII. No organisms belonging to types I, IV or V were detected throughout the investigation. TM

8 C 230
[Application of lysotyping for the differentiation of staphylococci from foods.] Anwendung der Lysotypie zur Differenzierung von Staphylokokken aus Lebensmitteln.
Kusch, D.; Sinell, H.-J.
Zentralblatt für Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, IB 157 (1) 78-88 (1973) [20 ref. De, en] [Inst. für Lebensmittelhygiene, Freie Univ. Berlin (West)]

8 C 239
Quantitative detection of type A staphylococcal enteroxin by Laurell electroimmunodiffusion.
Gasper, E.; Heimsch, R. C.; Anderson, A. W.
Applied Microbiology 25 (3) 421-426 (1973) [14 ref. En] [Dept. of Microbiol., Oregon St. Univ., Corvallis, 97331, USA]

The detection of staphylococcal enterotoxin A by the quantitative technique of electro-immunodiffusion is described. High dilutions of type-specific rabbit antiserum were used in 1% agarose gels, 1 mm thick, and prepared in barbital buffer (ionic concn. 0.05), pH 8.6. Volumes of 10 µl containing 1.5-10 ng of toxin were electrophoresed out of 4-mm diam. wells at 5 mA/cm width of gel. The precipitin cones formed were made visible by first immersing the agarose gels in 0.2M NaCl and then overlaying the surface with the purified globulin fraction of sheep serum against rabbit globulin, followed by soaking of the gels in 1% aqueous cadmium acetate and staining with 0.1% thiazine red in 1% glacial acetic acid. Fully extended cones, 4 to 23 mm in length depending on toxin concn. and antiserum dilution, were developed in 2-5 h of electrophoresis, and visualization was achieved within 2-3 h. Because the method is qualitative, quantitative, simple, rapid, and sensitive, it offers a practical tool for the detection of small amounts of bacterial toxins in contaminated foods. The method should also qualify as a sensitive detection device in biochemical procedures which attempt to trace, detect, and identify biological substances in nanogram quantities, provided these substances are antigenic and capable of forming a precipitate with their specific antibodies. AS

8 P 1193
Production of staphylococcal enterotoxin A in Blue, Brick, Mozzarella, and Swiss cheeses.
Tatini, S. R.; Wesala, W. D.; Jezeski, J. J.; Morris, H. A.
Journal of Dairy Science 56 (4) 429-435 (1973) [10 ref. En] [Dept. of Food Sci. and Nutr., Univ. of Minnesota, St. Paul, 55101, USA]

Brick, Swiss, Mozzarella and Blue (Minnesota method) cheeses were made from milk which had been inoculated with 10^4-1.6 million enterotoxin A-producing strains (196E and F265) of Staphylococcus aureus/ml; Streptococcus thermophilus C_3, Lactobacillus bulgaricus, Propionibacterium shermannii and/or Str. lactis C_2O were used as starters. Enterotoxin was detected in some Swiss and Brick cheeses but not in Mozzarella or Blue cheeses. Results suggest that

the min. Staph. aureus population associated with the presence of detectable amounts of enterotoxin is influenced by the cheese environment. Enterotoxin was not detected at 50 million Staph. aureus/g in Blue cheese made with normal or phage-inhibited C_2O starter; it was detected at 8 million Staph. aureus/g in Brick cheeses made with C_3 + C_2O starter but only at higher levels with C_2O starter. Enterotoxin was detected in Swiss cheese containing 7 million Staph. aureus 196E/g but not in that containing 50 million Staph. aureus F265/g; lack of enterotoxin production in the latter case may have been due to incomplete recovery of toxin-synthesizing capability after cooking at 50°C. CDP

8 S 1004

Effect of nitrite and nitrate on toxin production by Clostridium botulinum and on nitrosamine formation in perishable canned comminuted cured meat.

Christiansen, L. N.; Johnston, R. W.; Kautter, D. A.; Howard, J. W.; Aunan, W. J.

Applied Microbiology **25** (3) 357-362 (1973) [19 ref. En] [Swift and Co., Res. and Development Center, Oak Brook, Illinois 60521, USA]

Comminuted ham was formulated with different levels of sodium nitrite and nitrate, inoculated with Cl. botulinum, and pasteurized to an internal temp. of 68.5°C. When added to the meat, nitrite concn. decreased, and cooking had little effect on them. Nitrite concn. decreased more rapidly during storage at 27 than at 7°C; however, they remained rather constant at formulated levels throughout the experiment at both incubation temp. The level of nitrite added to the meat greatly influenced growth and toxin production of Cl. botulinum. The concn. of nitrite necessary to effect complete inhibition was dependent on the inoculum level. With 90 Cl. botulinum spores/g meat, botulinum toxin developed in samples formulated with 150 but not with 200 µg of nitrite/g meat. At a spore level of 5000/g, toxin was detected in samples with 400 but not with 500 µg nitrite/g of the product incubated at 27°C. Al lower concn. of nitrite, growth was retarded at both spore levels. No toxin developed in samples incubated at 7°C. Nitrate showed a statistically significant inhibitory effect at a given nitrite level; however, the effect was insufficient to be of practical value. Analyses for 14 volatile nitrosamines from samples made with varying levels of nitrite and nitrate were negetaive at a detection level of 0.01 µg nitrite or nitrate/g meat. AS

9 B 78

Pour-plate method for the detection of coagulase production by Staphylococcus aureus.

Parisi, J. T.; Baldwin, J. N.; Sottile, M.

Applied Microbiology **25** (4) 558-561 (1973) [13 ref. En] [Dept. of Microbiol., School of Med., Univ. of Missouri, Columbia, 65201, USA]

A pour-plate method is described for the detection of coagulase production by Staphylococcus aureus. Either brain heart infusion agar or yeast extract-trypticase soya agar containing swine plasma was the best medium for the detection of coagulase by this method. The advantages of this method and its potential utilization in the clinical laboratory, in food microbiology, and in specialized studies with Staph. aureus are discussed. AS

9 B 86

Studies on the suitability of sulphite cycloserine agar for the enumeration of Clostridium perfringens in food and water.

Mossel, D. A. A.; Pouw, H.

Zentralblatt für Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, IA **223** (4) 559-561 (1973) [7 ref. En, de] [Central Inst. for Nutr. and Food Res. TNO, Zeist, Netherlands]

A series of comparative trials with sulphite iron polymyxin neomycin agar [Appl. Microbiol. (1965) **13** 559] and sulphite cycloserine agar [FSTA (1972) **4** 4B41] was conducted, using 8 pure cultures of Clostridium perfringens, 40 food and feed samples, and 5 samples of sewage. Results showed that the 2 media gave very similar results; the cycloserine medium gave fewer false positive (30% vs. 50%), and smaller and more discrete colonies. AJDW

9 C 254

Growth and enterotoxin production by various strains of Staphylococcus aureus in selected foods.

Scheusner, D. L.; Harmon, L. G.

Journal of Food Science **38** (3) 474-476 (1973) [12 ref. En] [Dept. of Food Sci. & Human Nutr., Michigan St. Univ., East Lansin, 48823, USA]

Various strains of Staph. aureus were inoculated into commercial foods and incubated at 21°C for 48-119 h. Foods in which measurable enterotoxin was produced during incubation for 68-119 h had an initial pH of 5.51-6.60 and a terminal Staph. aureus population ranging from 1.7×10^7 to 5.7×10^8. The initial total count of these same foods varied from <10 to 3.0×10^2/g and the terminal total count varied from 7.9×10^7 to 4.3×10^9. During incubation periods extending to 48-71 h, inoculated foods with an initial pH <5.0 showed a decrease in staphylococcal population, and the total population, including inoculum, either decreased or remained stable. Staph. aureus strains produced enterotoxins A, B, C and D in vanilla pudding with an initial pH of 6.37 over a temp. range of 19-45°C. IFT

9 P 1418

[The occurrence of staphylococcal enterotoxin in butter.] Untersuchungen zum Vorkommen von Staphylokokken-Enterotoxin in Butter. [Thesis]

Maercklin, A.

58pp. (1972) [64 ref. De] [Tierärztliche Hochschule, Hannover, Federal Republic of Germany]

Neither enterotoxin nor coagulase-positive staphylococci were found in 47 samples of market butter (sour cream, sweet cream and salted butter, and butter with herbs). In model experiments with various strains of Staphylococcus aureus, enterotoxin was detected in pasteurized cream inoculated with Staph. aureus S-6 (enterotoxin B-producing) after 24 h at 30°C and 48 h at 20 or

37°C, but not in cream inoculated with Staph. aureus 264 (enterotoxin A-producing). The occurrence of enterotoxin in butter appeared to be mainly due to its presence in the original milk. When enterotoxin B was added to cream for buttermaking, it was detected in the buttermilk, wash water and butter serum. No enterotoxin was detected when an enterotoxigenic (A or B) strain of Staph. aureus, together with an antibiotic to which the organism was resistant, was added to cream for buttermaking. CDP

9 R 441
Bacterial production of dimethyl nitrosamine in salted fish.
Fong, Y. Y.; Chan, W. C.
Nature, UK **243** (5407) 421-422 (1973) [8 ref. En] [Dept. of Biochem., Univ. of Hong Kong]

Broth prepared by homogenization of Chinese salted marine fish (crude salt contained nitrate) was sterilized and then incoulated with 10^9 Staphyloccus aureus in 1 ml. The nitrate content of the broth was 40 ppm and the nitrite content 5 ppm. The material was incubated at 37°C and samples analysed for (i) dimethylnitrosamine after 0, 1, 2, 3, 5 and 7 days. A rise in concn. of (i) from 0.1 ppm on day 0 to approx. 0.55 ppm on day 7 was found, thus indicating the importance of the nitrate-reducing staphylococcus originally isolated from fish in the production of (i) from its precursors in the fish. No production of (i) occurred in control sterilized fish. JN

9 S 1059
Effects of synthetic meat components on growth of Clostridium perfringens.
Schroder, D. J.; Busta, F. F.
Journal of Milk and Food Technology **36** (4) 189-193 (1973) [10 ref. En] [Dept. of Food Sci. & Nutr., Univ. of Minnesota, St. Paul, 55101, USA]

The 16 ingredients used to fabricate synthetic soybeef (ground beef analogue) were evaluated for stimulatory effects on growth of Cl. perfringens. 4 ingredients (beef-like flavour, corn flour, cocoa, and vegetable oil) stimulated growth of Cl. perfringens. The remaining 12 ingredients showed no significant effect. The most stimulatory ingredients, beef-like flavour and corn flour, were optimally stimulatory over a wide range of concn. Thus, control of growth of Cl. perfringens may not be obtained by manipulation of the concn. of these ingredients in the absence of other precautions. AS

9 S 1093
The detection of Clostridium welchii in the differential reinforced clostridial medium technique.
Gibbs, P. A.
Journal of Applied Bacteriology **36** (1) 23-33 (1973) [16 ref. En] [Queen's Univ., Newforge Lane, Belfast BT9 5PX, UK]

The enumeration of sparse populations of clostridia by a total clostridia count technique in a fluid medium (DRCM [Gibbs & Freame, Journal of Applied Bacteriology (1965) **28**: 95]) gives small estimates of the numbers of Clostridium welchii. This organism may be readily detected in mixed 'presumptive total' clostridia cultures by streaking on lactose-egg yolk-milk agar before pasteurizing these cultures. The results of screening poultry carcasses and processing plants with this technique are presented and the incidence of Cl. welchii on 3 sites of poultry carcasses (breast, vent and neck skin) are compared for 3 processing plants. AS

10 C 280
Rapid solid-phase radioimmunoassay for staphylococcal enterotoxin A.
Collins, W. S.; Johnson, A. D.; Metzger, J. F.; Bennett, R. W.
Applied Microbiology **25** (5) 774-777 (1973) [10 ref. En] [US Army Med. Res. Inst. of Infectious Diseases, Frederick, Maryland 21701, USA]

A rapid solid-phase radioimmunoassay for staphylococcal enterotoxin A is described. The assay procedure requires 3-4 h for completion and uses a competitive inhibition system in which the antibody is attached to bromacetyl cellulose particles. It is accurate to a level of 0.01 µg enterotoxin A/ml in a variety of media such as ham, milk products, crab meat and custard. No significant interference was found with any media or food product tested. AS

10 C 283
Effect of temperature and pH on growth and enterotoxin production by Staphylococcus aureus.
Scheusner, D. L.; Hood, L. L.; Harmon, L. G.
Journal of Milk and Food Technology **36** (5) 249-252 (1973) [18 ref. En] [Dept. of Food Sci. and Human Nutr., Michigan St. Univ., East Lansing, 48823, USA]

10 H 1707
[Special sensory method for the evaluation of fruit juices.] Spezielle sensorische Prüfmethoden zur Beurteilung von Fruchtsäften.
Neubert, K.-P.; Ach, G.
Flüssiges Obst **40** (4) 140-144 (1973) [23 ref. De, en]

Principle and application (to apple) of the "profile method" of analysing fruit juices (based on the principle of listing good and bad qualities in the order that the tester becomes aware of them, assessing their intensity, and mathematically determining "total quality"), "dilution profile analysis" (appreciation of qualities and intensity assessment with increasing dilution), and assessment of "time-intensity behaviour" (quality intensities at various intervals of time after tasting) are described. [See also FSTA (1972) **4** 3H376.] MJD

10 P 1476
Spore properties of clostridia occurring in cheese.
Bergere, J.-L.; Hermier, J.
Journal of Applied Bacteriology **33** (1) 167-179 (1970) [47 ref. En] [Sta. Centrale de Recherches Laitieres et de Tech. des Produits Animaux, INRA, 78, Jouy-en-Josas, France]

10 P 1501
Transfer of antibiotic resistance between strains of Staphylococcus aureus in milk products. [Letter]
Lacey, R. W.; Didcock, R.
Lancet **1** (7807) 825 (1973) [2 ref. En] [Dept. of Bacteriology, Univ. of Bristol, UK]

Transfer of tetracycline resistance from a donor strain (no. 609) to a recipient strain (no. 6936) of Staph. aureus was demonstrated in milk products which had been inoculated with both strains on the day of purchase and incubated at 37°C or room temp. (21°C) for 24 h. Frequency of transfer of resistance was up to 10^{-4} (number of resistant recipients/total recipients) in fresh single and double cream, fresh milk, boiled fresh milk, canned sterilized dairy cream, canned evaporated milk and pasteurized Devon cream. Pasteurized fresh soured cream and Cottage cheese were inhibitory to the staphylococci. Transfer of resistance was detected only at room temp. (frequency $<10^{-8}$) in fresh cream dessert, and was not detected in bottled UHT milk. The mechanism of resistance transfer is thought to be transduction. CDP

10 R 478
Evaluation of potential risk of botulism from seafood cocktails.
Lerke, P.
Applied Microbiology **25** (5) 807-810 (1973) [10 ref. En] [G. W. Hooper Foundation, Lab. for Res. in the Canning Ind., 1950 Sixth Street, Berkeley, California 94710, USA]

Clostridium botulinum E could not be detected in 35 samples of commercial seafood cockails, ranging in pH from 4.10 to 4.85. At 30°C, toxinogenesis in homogenates acidified with a citric-acetic acid mixture was prevented at pH 4.86 or lower for crabmeat and at 5.03 or lower for shrimp. Measurements of the rate of acid penetration into the centres of large pieces of flesh indicated that the already small risk of botulism from seafood cocktails could be completely eliminated by using a cocktail sauce at a max. pH of 3.70 and by cooling the final product to at least 10°C for 24 h. AS

10 U 712
[Food products: detection of pathogenic staphylococci.]
Poland, Polski Komitet Normalizacji i Miar
Polish Standard **PN-72/A-04024** 7pp. (1972) [Pl]

This standard replaces **PN-65/A-04024** and covers detection of coagulase- and phosphatase-positive pathogenic staphylococci in food products in production control and in connection with outbreaks of food poisoning. Stipulated procedures for sample preparation, use of Giolitti-Cantoni, Baird-Parker and other media, and biochemical examination and interpretation of findings are listed, and relevant apparatus, equipment, solutions and media are described in detail. SKK

11 C 291
Antibiotic, inhibitory and toxic metabolites elaborated by microorganisms in foods. [Review]
Ayres, J. C.
Acta Alimentaria Academiae Scientiarum Hungaricae **2** (3) 285-302 (1973) [103 ref. En] [Food Sci. Dept., Univ. of Georgia, Athens, 30602, USA]

11 C 293
Effect of water activity and pH on staphylococcal enterotoxin B production.
Troller, J. A.
Acta Alimentaria Academiae Scientiarum Hungaricae **2** (3) 351-360 (1973) [13 ref. En] [Procter & Gamble Co., Winton Hill Tech. Center, Cincinnati, Ohio 45224, USA]

11 J 1817
[Presence of the tetanus bacillus in home-preserved apples.]
Kirsanov, G. P.
Gigiena i Sanitariya No. 8, 108 (1973) [Ru] [Mordovskii Univ. imeni N. P. Ogareva, Saransk, USSR]

Home preservation of fruit is very popular in the Mordovian SSR. Apples are prepared for preservation by thorough washing in boiling water. 500 jars of preserved apples made in Sept. 1971 on the Mordovian University farm were stored at 12-14°C and examined daily. During March and April 1972, contents of 17 jars became cloudy and gas formation was evident. The jars were opened and culturing and mouse tests demonstrated the presence in all of them of Clostridium tetani. SKK

11 K 101
A study on survival of Staphylococcus aureus in dark and milk chocolate.
Ostovar, K.
Journal of Food Science **38** (4) 663-664 (1973) [9 ref. En] [Div. of Food Sci. & Ind., Pennsylvania St. Univ., University Park, 16802, USA]

Dark and milk chocolate bars were inoculated with Staph. aureus to establish an initial population of approx. 10^3, 10^5 and 10^7 cells/g. Samples were stored at room temp. and examined for the survival of staphylococci at 2-day intervals for the first 6 days and every 8 days thereafter. Counts of <100 cells/g were obtained after: (a) 2 days in dark and 14 days of storage in milk chocolate when the samples were inoculated with 10^3 cells/g; (b) 38 days in dark and 86 days in milk chocolate when the bars were inoculated with 10^5 cells/g; and finally (c) 86 days in dark and 110 days of storage in milk chocolate when the samples were inoculated with 10^7 cells/g. IFT

11 P 1567
[Chemical composition, quality and stability of basic infant milk formulae.]
Dabrowska, W.; Pawlik, A.; Pawlik, S.; Skrzypek, J.
Roczniki Instytutu Przemyslu Mleczarskiego **14** (3) 17-31 (1972) [7 ref. Pl, ru, en] [Inst. Przemyslu Mleczarskiego, Warsaw, Poland]

The following mean values based on analyses of 10 and 7 commercial batches respectively are tabulated for A (Laktowit III) and B infant milk formulae produced as described in FSTA **5** (1973) 3P275: moisture, 4 and 4%; fat 17.1 and 16.7%; protein, 16.6 and 16.3%; lactose, 21.1 and 20.5%; sucrose, 25.8 and 25.4%; starch, 11.8 and 11.6%; citric acid, 0 and 2.0%; mineral salts, 3.6 and 3.5%; vitamin A, 1250 and 1250 IU/100 g; vitamin D_3, 500 and 500 IU/100 g; and ascorbic acid, 25 and 25 mg/100 g. The A and B formulae were stored for 4 and 2 months respectively at room temp. in 0.5-kg polyethylene bags within carton board boxes, or in 0.25-kg polyethylene/Al/cellophane laminate bags of domestic or foreign manufacture. No appreciable changes in composition or organoleptic quality were detected after storage in any of the packages. Microbial contamination was within the permitted limits and coliforms, pathogenic staphylococci or haemolytic streptococci were never detected. SKK

11 P 1569
Enterotoxigenic staphylococci in milk and milk products.
Ghosh, S. S.; Laxminarayana, H.
Indian Journal of Animal Sciences **42** (7) 492-498 (1972) [30 ref. En] [Nat. Dairy Res. Inst., Karnal, Haryana]

Of a total of 740 staphylococci isolated from 995 market samples of milk and milk products in Karnal, 320 were coagulase-positive, of which only 25 were enterotoxigenic (type A, B or AB); none of the coagulase-negative strains was enterotoxigenic. The numbers of coagulase-positive and enterotoxigenic strains respectively isolated from the various milks and milk products were (number of samples in parentheses): individual quarter milk samples (560), 119 and 7; farm bulk milk (60), 41 and 2; raw market milk (160), 100 and 7; pasteurized milk (30), 7 and 0; and milk products (185), 53 and 9. No coagulase-positive or enterotoxigenic staphylococci were found in the 35 processed cheese samples; no enterotoxin-producing staphylococci were found in the 25 dried skim-milk or 10 butter samples, but they were isolated from 10% of the 60 ice cream, 6.7% of the 15 kulfi and 5% of the 40 Cheddar cheese samples. [See also FSTA **5** (1973) 2P104.] CDP

12 C 338
[Methods of identifying Clostridium perfringens in foods.]
Nikolaeva, S. A.
Konservnaya i Ovoshchesushil'naya Promyshlennost' No. 1, 26-28 (1973) [2 ref. Ru] [Vses. Nauchno-issled. Inst. Konservnoi i Ovoshchesushil'noi Promyshlennosti, USSR]

Litmus milk and a medium recommended by Hungarian workers were tested for ability to isolate Cl. perfringens. The medium contained 200 ml whey from separated milk, 10 g glucose, 100 ml yeast extract, 700 ml meat extract and 2 g peptone; pH was 7.0. To both media, 0.08% cysteine was added as reducing material or 0.005% sodium azide to inhibit the growth of facultative and anaerobic microorganisms. With both media, better results were achieved when cysteine was added, although litmus milk proved to be satisfactory even without addition of cysteine. The procedure is described for isolation of Cl. perfringens from various food products and swabs from canning plant equipment, using litmus milk with added cysteine. STI

12 G 593
Influence of freezing animal tissue in liquid nitrogen on its histological structure and microbiological alterations.
Piskarev, A. I.; Kaminarskaya, A. K.; Moiseyeva, E. L.; Dibirasulayev, M. A.; Balandina, F. A.
Proceedings of the International Congress of Refrigeration (13th Washington) **3**, 227-235 (1971, publ. 1973) [2 ref. En, fr] [Sci. Res. Inst. of Refrigerating Ind., Moscow, USSR]

The effect of freezing rate (air-freezing vs. freezing in liquid N) on the histology of meat and fish was investigated; results showed that freezing meat in liquid N results in greater histological changes than air freezing. Considerable changes were observed in fish tissue frozen by both techniques. In a second experiment, the effect of freezing and thawing on the concn. of free amino acids and other ninhydrin-positive substances in meat was investigated. Meat samples were frozen at -18, -50 and -195.5°C, thawed, and stored for ≤12 days at 0°C. Results showed that free amino acid formation increases with decreasing freezing temp., thawed meat contains more free amino acids than non-frozen meat. In a further experiment, the effects of freezing on the viability of (i) Pseudomonas fluorescens and (ii) Staphylococcus aureus in fish and milk were investigated. Results showed that (ii) was more freeze-resistant than (i); freezing had no effect on the subsequent generation time, proteolytic activity and toxin formation characteristics of the bacteria. AJDW

12 P 1861
Staphylococcal enterotoxin A development in Cheddar cheese slurries.
Gandhi, N. R.; Richardson, G. H.
Journal of Dairy Science 56 (8) 1004-1010 (1973) [31 ref. En] [Dept. of Nutr. and Food Sci., Utah St. Univ., Logan, 84322, USA]

Staphylococcus aureus growth and enterotoxin A production occurred in Cheddar cheese slurries containing 45 and 60% moisture following inoculation with 10^3 to 10^5 staphylococci/g and incubation at 32°C for 24-48 h. Process modifications to control staphylococcal growth were evaluated. Treatment of slurries with 0.5% H_2O_2 was not effective. Heating slurries at 72°C for 30 min eliminated staphylococci, but reinoculation with ripening organisms was essential for proper flavour development. Sorbic acid at 0.2-0.3% inhibited staphylococci, but because of inhibition of micrococci and lipolytic agents, cheese flavour development was retarded. However, sorbate addition was preferred over other treatments; non-protein N increase in cheese slurries paralleled that of sorbate-free controls. AS

12 S 1466
Microbial changes leading to the spoilage of hung pheasants, with special reference to the clostridia.
Mead, G. C.; Chamberlain, A. M.; Borland, E. D.
Journal of Applied Bacteriology 36 (2) 279-287 (1973) [18 ref. En] [Agric. Res. Council, Food Res. Inst., Colney Lane, Norwich NOR 70F, UK]

A spoilage problem affecting hung pheasants is described in which carcasses showed rapid greening and deterioration during hanging. No microorganisms were detected in samples of muscle tissue taken from abnormal carcasses but clostridia and often coli-aerogenes bacteria were unusually abundant in the duodenum and in the remainder of the small intestine. The clostridia were mainly Clostridium bifermentans/sordelli or strains resembling Cl. welchii and these organisms outgrew all other bacteria in the duodenum under suitable hanging conditions. When grown at low temp. [15-20°C], strains of clostridia and Escherichia coli from pheasants produced large amounts of H_2S which is concerned in the greening process. Some other properties of the clostridia are described and the significance of the spoilage problem is discussed. AS

12 S 1497
The fate of a toxigenic strain of Staphylococcus aureus in vacuum-packaged bacon.
Dempster, J. F.; Kelly, W. R.
Journal of Hygiene 71 (3) 565-575 (1973) [30 ref. En] [Dunsinea Res. Centre, An Foras Taluntais, Castleknock, Co., Dublin, Irish Republic]

Pork was cured by (a) the Wiltshire method and (b) a hygienic sweet cure process. Representative samples of both bacons were inoculated at 'low' density (10^3 organisms/g) and 'high' density (10^6 organisms/g) with a toxin-producing strain of Staphylococcus aureus. 'High' and 'low' density samples of both bacons were each stored at 5°C for 42 days and 15°C for 21 days. Results indicated that the test organism at high inoculum density grew slowly in both bacons at 5°C. The organism survived at 5°C in both 'low' density bacons. At 15°C, the test organism grew, growth being more pronounced in the 'hygienic' than in Wiltshire bacon. AS

COPYRIGHT REGULATIONS

Form of Declaration and Undertaking

To the Editor, International Food Information Service, Shinfield, Reading, RG2 9AT, Berkshire, England.

1. I .....

   of .....

   Hereby request you to make and supply to me a photocopy of the article covered by

   Journal name .....

   Volume ..... Part ..... Pages..... Year .....

   which I require for the purpose of research or private study.

2. I have not previously been supplied with a copy of the said article/part of the said work by any librarian.

3. I undertake that if a copy is supplied to me in compliance with the request made above, I will not use it except for the purpose of research or private study.

   Signature* ..... Date .....

   (*Note: This must be the personal signature of the person making the request. A stamped or typewritten signature or the signature of an agent is NOT sufficient.)

4. Send this form and remittance (7p per page) to the above address.

(Note: Additional forms are available on request.)

COPYRIGHT REGULATIONS

Form of Declaration and Undertaking

To the Editor, International Food Information Service, Shinfield, Reading, RG2 9AT, Berkshire, England.

I .....

of .....

Hereby request you to make and supply to me a photocopy of the article covered by Journal name .....

Volume ..... Part ..... Pages ..... Year .....

which I require for the purpose of research or private study.

2. I have not previously been supplied with a copy of the said article/part of the said work by any library.

3. I undertake that if a copy is supplied to me in response with the request made above, I will use it except for the purpose of research or private study.

Signature ..... Date .....

(Note: This must be the personal signature of the person making the request. A stamped or typewritten signature or the signature of an agent is NOT sufficient).

4. Send this form and remittance (7p per page) to the above address.

(Note: additional forms are available on request).

Additional Services available from IFIS

RETROSPECTIVE SEARCH SERVICE

- Over 60,000 documents in FSTA searched
- State-of-the-art or "quicky" telephone requests accepted
- Annual contracts with discount available
- Cost from £5 per volume of FSTA for references; £7.50 per volume for abstracts
- Information available in 3 output formats
- Searches conducted by qualified food science graduates

PHOTOCOPYING SERVICE

- All journal articles abstracted in FSTA available promptly
- Cost 7p per page for single orders
- Deposit account service in operation
- Original articles available as output from retrieval services at 40p per article.

See also inside front cover

FOOD ANNOTATED BIBLIOGRAPHIES

Selected abstracts from Food Science and Technology Abstracts on important specialized aspects of food science and technology are now available as Food Annotated Bibliographies (FABs).

The FABs already completed are listed below, and further FABs are in preparation. Suggestions are welcomed for specific topics for additional bibliographies.

FAB	Title	No. Ref.	Price	Vol. 1-3	No. Ref.	Price	Vol. 4	Vol. 5 (1973) Monthly (12 issues)
1.	Application of Reverse Osmosis to Food Processing	104	£2.00	☐	58	£2.00	☐	£4.00 ☐
2.	New Sources of Food Protein	662	£6.00	☐	332	£3.50	☐	£9.00 ☐
3.	Natural and Synthetic Sweeteners	338	£3.50	☐	198	£2.00	☐	£6.00 ☐
4.	Techniques for Analysis of Flavour Volatiles	367	£4.00	☐	237	£2.50	☐	£7.00 ☐
5.	Microwaves in Food Processing	160	£2.00	☐	103	£2.00	☐	£5.00 ☐
6.	Texture Analysis of Foods	426	£4.50	☐	429	£4.50	☐	£11.00 ☐
7.	Synthetic Dairy Products	150	£2.00	☐	88	£2.00	☐	£4.00 ☐
8.	Acidulants in Foods	413	£4.50	☐	200	£2.50	☐	£7.00 ☐
9.	Agglomeration of Powders	73	£2.00	☐	34	£2.00	☐	£4.00 ☐
10.	Aseptic Packaging	131	£2.00	☐	79	£2.00	☐	£4.00 ☐
11.	EEC Regulations	55	£2.00	☐	64	£2.00	☐	£4.00 ☐
12.	Toxicology of Food Additives	118	£2.00	☐	106	£2.00	☐	£5.00 ☐
13.	Deep Fat Frying	400	£4.00	☐	248	£2.50	☐	£7.00 ☐
14.	Viscosity of Foods	399	£4.00	☐	212	£2.50	☐	£7.00 ☐
15.	Taste Panels in Food Science	78	£2.00	☐	86	£2.00	☐	£4.00 ☐
16.	Taints in Foods	126	£2.00	☐	77	£2.00	☐	£4.00 ☐
17.	Microbial Toxins in Foods	113	£2.00	☐	87	£2.00	☐	£4.00 ☐
18.	Smoked Food Products	249	£2.50	☐	112	£2.00	☐	£5.00 ☐
19.	Disposal of Waste Food Products	395	£4.00	☐	262	£3.00	☐	£8.00 ☐
20.	Use of Glucose in Food Products	124	£2.00	☐	99	£2.00	☐	£4.00 ☐
21.	Emulsifiers in Foods	253	£3.00	☐	161	£2.00	☐	£6.00 ☐
22.	Stabilizers in Food	222	£2.50	☐	250	£3.00	☐	£8.00 ☐
23.	Staling and Anti-staling Additives	58	£2.00	☐	25	£2.00	☐	£4.00 ☐
24.	Catering Industry	51	£2.00	☐	29	£2.00	☐	£4.00 ☐
25.	Antioxidants (in preparation)							
26.	Nitrosamines	31	£2.00	☐	32	£2.00	☐	£4.00 ☐

*Vol. 1-2 only

☐ Suggested topics for FABs.....

SDI and Retrospective Searches

The International Food Information Service is now able to provide selective dissemination of information and retrospective searches.

☐ I require an SDI/Retrospective Search on the following topics.

Please send me an estimate.....

Prices include postage by surface mail. For airmail rates, please apply to the address below.

To order, or to obtain further information, mark the item required, add your name and address, and send cash, cheque or postal order to:

International Food Information Service,
Commonwealth Bureau of Dairy Science and Technology,
Shinfield, Reading RG2 9AT, England.

Name .....

Address .....

.....

.....